The Journal of Sri Krishna Research & Educational Consortium

International Journal of Marketing and Management Research

Internationally Indexed & Listed Referred e-Journal

A RESOURCE ALLOCATION MODEL FOR INSURANCE MANAGEMENT USING GOAL PROGRAMMING

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ABSTRACT

This research paper focuses on Goal Programming and its applications for resource allocation to insurance management in order to achieve the liquidity goal. It also presents an analysis of the H-D model using Goal Programming and liquidity. The Holfflander and Drandell (H-D) paradigm is examined through the use of goal programming. It is investigated if a linear programming model can be constructed to find the optimal asset allocation in order to maximise profits. In order for the model to work, it must be built around restrictions reflecting policy and regulatory constraints on the insurer's operations. The goal of this study is the same as that of the original H-D model, and it is to investigate.

KEYWORDS: Goal, Programming, Asset, Liquidity, Insurance, Management.

I. INTRODUCTION

Personal Lines Insurance is intended to cover risks to the person and property of people or groups of persons, as well as liabilities that may arise as a result of such risks. Personal Accident Insurance, Mediclaim Insurance, Critical Illness Insurance, and Amartya Siksha Yojana are some of the types of insurance available to individuals. Householders' insurance, Niwas Yojana insurance, motor insurance, and other types of property insurance are available. A person's liability insurance would cover any responsibility that arises from his or her own actions or inactions or from the practise of his or her profession, such as personal liability insurance, professional indemnity insurance for a doctor or lawyer, and etc. Since nationalisation, our company has been working on expanding its General Insurance business into rural areas, with the social goal of servicing the requirements of the economy while also looking out for the interests of the most vulnerable members of the society in mind. Our company has developed a number of insurance policies that are targeted specifically at rural people and the economically disadvantaged sections of urban society in order to provide financial protection against the loss of their small income-generating assets as a result of the occurrence of fortuitous events. Industrial insurance is another type of non-life insurance that protects businesses against a variety of hazards that they may encounter in the course of doing business. It also helps to ensure that businesses continue to develop. These insurances may be classified into two main categories: Project Insurance and Operational Insurance.

Project Insurance is the most common type of insurance. All-risk insurance for erection and contractor's all-risk insurance for construction are the two most fundamental types of project insurance. Fire insurance plans, machinery insurance policies, electronic equipment insurance policies, and consequential loss (fire) insurance policies are some of the most often selected Operational Insurance products. Commercial activity of different types, including commerce, transportation, banking, and other financial services, is the backbone of our economy. They are subject to risks that may be divided into two categories: loss of or damage to property/assets and liability arising out of an action or omission during the course of their business operation. There are a variety of alternatives available via national insurance that allow a commercial organisation to protect itself against losses caused by a variety of dangers. These choices may be divided into three categories: package policies, special policies to protect against property damage, and particular policies to cover liability arising from mistakes and omissions in the course of business activity.

II. GOAL PROGRAMMING MODEL

The notion of general practise (GP) is relatively new, despite the fact that it had been proposed some time before. In a recent paper, a thorough description of the approach is provided. If you are dealing with business models, it is a very crucial extension of linear programming to know about. Goal Programming is a mathematical model that may be expressed as follows, in a nutshell:

Minimize $Z = \sum^{m}{}_{1} p_i \times (d_i^- + d_i^+)$

Subject to $a_{11}x_1 + a_{12}x_2 + \cdots \ldots \ldots \ldots\ldots + a_{1n}x_n + d^- - d^+ = g_1$

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$a_{m1}x_1 + a_{m2}x_2 + \cdots \ldots \ldots \ldots \ldots + a_{mn}x_n + d_m^- - d_m^+ = g_m,$

$b_{11}x_1 + b_{12}x_2 + \cdots \ldots \ldots \ldots \ldots + b_{1n}x_n \leq c_1$

$\ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots\ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .$

$\ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots\ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .$

$b_{r1}x_1 + b_{r2}x_2 + \cdots \ldots \ldots \ldots \ldots + b_{rn}x_n \leq c_r$

The variables are represented by the letter x_1, the constants by the letter a1, and the objectives by the letter g_1, with the first m equations representing the relationships that the model must fulfil at all times. The variables d_1^- and d_1^+ are referred to as deviational variables since they indicate the possibility of deviating from the respective objectives. The former represents underachievement, whilst the latter represents overachievement in terms of the variety of ethical. A non-zero value for at least one of these variables is possible for every goal equation. If both of these values are 0, the aim has been attained perfectly. If overachievement is permitted, the variable d_1^+ must exist in the objective function; if under-underachievement is permitted, the variable d_1^- does not need to be in the objective function. Based on a specified priority system, the objective function seeks to reduce deviations from the goals to the bare minimum. According to a predetermined order, high-priority objectives are met before low-priority objectives are met. The priority of a deviational variable associated with multiple objectives might be the same or vary depending on the aim. In order to solve the model, a modified linear programming computer code was utilised.

III. THE H-D MODEL IN A GOAL PROGRAMMING CONTEXT

A reference set of variables and constraints for the H-D linear programming model are given in tables 1 and 2 for convenience of comparison.

Table 1 Variables in the H-D Model

Assets		Liabilities	
A(1)	Bonds	L(1)	UnpaidClaimsorLossReserves
A(2)	CommonStocks	L(2)	UnearnedpremiumReserves
A(3)	Preferred Stocks	L(3)	MiscellaneousLiabilities
A(4)	Mortgages	L(4)	PolicyholdersSurplus
A(5)	RealEstate	L(5)	TotalLiabilities
A(6)	Cash		
A(7)	PremiumBalances		
A(8)	TotalAssets		

Others Variables

Y Premiums Written

Priority	GoalDescription	Corresponding ConstraintsfromTable2
1	Liquidity	7
2	Stability	2,4,5,6
3	Profit	ProfitFunction

It is believed that the insurer has a total asset base of Rs.100 million.

According to the following, the aim and its relationship to the initial restrictions, along with the anticipated appropriate priorities, are set:

3.1 Communications

Table 2 Constraints of the (H-D) Model

ConstraintsNo.	Constraint	Explanation
(1)	L(4)≥3.0	Policyholder's Surplus (net equity) must equal or exceed83million
(2)	A(1)≥L1	Thebondportfoliomustequalorexceedthereserveforunpaidclaims.
(3)	Y≤4L(4)	Premium volume must be equal to or less than 4 timespolicy holders surplus.(General rule regulation in severalstate)
(4)	A(8)/Y≥1.23	Ratioofassetstopremiumvolumemustexceed1.23(thisistheEnglishcoverratio)
(5)	A(1)+A(4)+A(8) ≥ L(4)+.5[L(1)+L(2)]	Bonds, mortgages and each asset exceed capital plus one half the sum of the unearned premium reserve and the loss reserve.
(6)	A(1)+A(4)+A(8) ≥ L(1)+L(2)	Bonds, mortgages and cash must equal or exceed the unearned premium and the loss reserve.
(7)	A(6) ≥.10L(1)	Cash on hand should be equal to or exceed 10% or unpaid claims (general liquidity rule)
(8)	A(7)-.20Y	Premium balances on an average are assumed to be 20% of premium volume.
(9)	A(4)+A(5) ≤.03A(8)	Mortgage plus real estate should be less than or equal to 5% of total assets.
(10)	.07L(5) ≤L(3) ≤.09L(5)	Miscellaneous liabilities should be 7 and 9 percent of total liabilities
(11)	L(1)-60Y	Loss reserves are assumed to be 60% of premium volume.
(12)	L(2)-.70Y	Unearned premium reserves are assumed to be 70% of premium volume.
(13)	A(8)-100+1.1Y	Total assets are equal to Rs.100 + 110% of premium volume.

IV. GOAL PROGRAMMING MODEL ANALYSIS

This is the current version of the H.D. model in Goal Programming, in form of speech with priority given to the deviational variable:

$$\text{Minimize } Z= p_1 d_1^- + p_2(d_2^- + d_3^- + d_4^- + d_5^-) = p_3 d_6^-$$

According to the following restrictions:

Liquidity (Priority 1−$\boldsymbol{p_1}$): (6) − .10L(1) + d_1^- − d_1^+ = 0

Stability (Priority 2 −$\boldsymbol{p_2}$): (1) − L(1) + d_2^- − d_2^+ = 0,

(8) − 1.25x + d_3^- − d_3^+ = 0,

(1) + A(4) + A(6) − L(1) − .5L(1) − .5L(2) + d_4^- − d_4^+ = 0,

$$A(1) + A(4) + A(6) - L(1) - L(2) + d_5^- - d_5^+ = 0,$$

Where R (i)1 represents the after-tax return on investment A(i);R measures the return on premiums issued Y; and Po represents a profit target that has been established. In addition, the model is subset to the remainder of the items in table 2.

Several sources were used to determine the value of bonds, common stock, and preferred stock, including Standard and Poor's 1975 Trade and Securities, Indian Financial Data, the Reserve Bank of India, and the current market as reported in prominent financial magazines. The returns on mortgages and real estate investments are determined by the present situation of the market. All returns were adjusted for taxes based on a 50 percent tax bracket for all of the returns.

V. RESULT AND DISCUSSIONS

Runs were performed for R=-.05, -.025, 0.0, +.025 and +.05. Runs were performed for R= -.025, 0.0, +.025 and +.05. It was decided to establish a high-profile target of Po = Rs. 50 million in order to discover the greatest profit that could be made on each run. However, this aim was never accomplished because it functioned simply as an upper limit to the highest Profit that could be earned on any given run. The allocations for these runs are shown in Table 3.

Table 3 Allocations for Ranges of R

Assets		-.05	-.025[R]	0.0	+.025	+.05
A(1)	Bonds	Rs.95.0	233.5	*	*	*
A(2)	CommonStocks	0.0	0.0	*	*	*
A(3)	Preferred Stocks	0.0	0.0	*	*	*
A(4)	Mortgages	0.0	0.0	*	*	*
A(5)	RealEstate	5.0	14.7	*	*	*
A(6)	Cash	0.0	10.6	*	*	*
A(7)	PremiumBalance	0.0	35.3	*	*	*
A(8)	TotalAssets	Rs.100.0	294.1	*	*	*
Liabilities						
L1	UnpaidClaims	0.0	105.9	*	*	*
L2	UnearnedPrem.Res.	0.0	123.5	*	*	*
L3	Misc.Liabilities	97.0	20.6	*	*	*
L4	Policyholderssurplus	3.0	44.1	*	*	*
L5	TotalLiabilities	Rs.100.0	294.1	*	*	*
Y	PremiumWritten	0.0	176.5	*	*	*
	Profit	4.8	7.5	11.9	16.4	20.8

From Table 3 it is viewed that since A(6) = .10L(1), then, at that point, $d_1^- = d_1^+ = 0$.

Accordingly the Liquidity objective is fulfilled, as in the (H-D) model.

VI. CONCLUSION

The deviational variables _______ $=d_3^- = d_4^- = d_5^- = 0$ in the stability constraint equations. The Stability constraint equations have all been overachieved in the H-D model since they exist only in the objective function connected with Priority 2, and not in any other objective function related with Priority 1. In the end, the profit objective was not attained and it was not expected to be. This range of values for R is shown to have the same Effect, with the exception of Y and Profit varying in this range. When R = -.05, underwriting is halted and the insurer transitions to the role of an investment house. Interestingly, this analysis holds true for R -.05, with profit = Rs.4.8 being consistent across this range. Given the way the model was defined, it is feasible to create a linear function connecting Profit to return on premium R o, which yields the equations: Y=O and Profit =Rs. 4.8, distributing rice to those who may be cared for.

REFERENCES

1. Benjamin C. O., et al., Planning Facilities at the University of Missouri, Rolla Interfaces, 22(4), (1992), 95-105.

2. Diminnie C. B., et al., A Hierarchical Goal Programming Approach to Reserve Resource Allocation in Institutions of Higher Learning, Journal of Operational Research, 37, (1986), 59-66.

3. ElifKılı., A Mixed Integer Goal Programming Model for Discrete Values of Design Requirements in QFD Rations Research, an Introduction, International Journal of Production Research, (2010).

4. Fernando et al., A Goal Programming Approach to Estimating for Best Selection of Strategic Plans in BSC Model, Journal of American, (2010).

5. FORTMP, User Reference Manual, Brunel University and NAG Ltd., U.K., (1994).

6. Ignizio B. P., Linear Programming in Single and Multi-Objective Systems, Prentice Hall, Engle Wood Chiffs, (1982).

7. Lee S. M., et al., A Goal Programming Model for Academic Resourse Allocation, Management Science, 18, (1972) 395-408.

8. Mahmoud A., et al., Fuzzy Goal Programming Procedure to Bilevel Multiobjective Linear Fractional Programming Problems, International Journal of Mathematics and Mathematical Sciences Journal of Operational Research, 2010, (2010), 15, Article ID 148975.

9. Aouni B, Ben Abdelaziz F and Martel J M, “Decision-maker's preferences modeling in the stochastic goal programming”. European Journal of Operational Research, Vol. 162(3), pp. 610-618, 2005.

10. Arthur JL and Ravindran A, “A Multiple Objective Nurse Scheduling Model”. IIE Transactions, Vol. 13(1), pp. 55-60, 1981.